

PLANS AND DOCUMENTS
referred to in the PDA
DEVELOPMENT APPROVAL

Approval no: DEV2018/991

Date: 24 September 2019



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Electrical Services

Carpark lighting Design Report

PROJECT NUMBER
18-1393

ISSUE
B

DATE
19 November
2018

For Redland Investment Corporation

At Weinam Creek

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Revision History

Issue	Date	Description	Initials
A	06 November 2018	Preliminary Issue	JM
B	19 November 2018	Pedestrian walkway added	JM

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1. INTRODUCTION

Peter Eustace and Associates have been commissioned to prepare a report for Redland Investment Corporation to discussing the proposed lighting requirements of the proposed Weinman Creek Carpark.

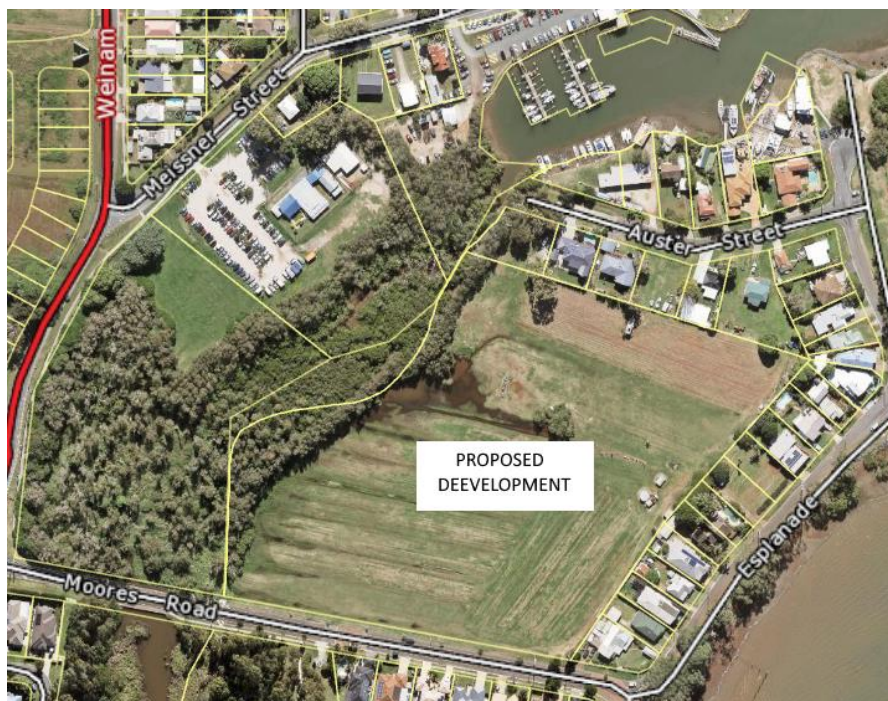
This report shall discuss the lighting impacts of the proposed development on the surrounding areas and how compliance can be achieved to meet the requirement for pedestrian area (Category P) lighting. To perform the assessment the lighting design software AGI32 was used and the following Australian were applied.

AS 4282:1997 – Control of Obtrusive Effects of Outdoor Lighting.

AS/NZS 1158.3.1:2005 Part 3.1: Pedestrian area (Category P) lighting – Performance and design requirements.

2. PROJECT DESCRIPTION

The Image below details the site location of the proposed development. By reviewing the site below it can be observed that there are existing residential dwellings to the north and east of the site and vegetation area to the west of the proposed development.



Appendix A details the proposed carparking plans and staging arrangements for this development. It should be noted that it is expected that the stage 1 line making for the trailer parking will be modified from stages 1 to 3 however it is expected that the storm water swales we remain in the same position.

3. DEVELOPMENT REQUIREMENTS

AS 4282 Control of the obtrusive effects of outdoor lighting

The table below is an extract from AS4282 which lists the recommended maximum values for illuminance in the vertical plane for the pre-curfew and curfew hours. The proposed development is carpark for boating activates, it could be classed as commercial at the boundary of residential areas.

However, given that there are little other commercial areas within the vicinity of this development and to maintain the aesthetic appeal of the area. We would consider that a fairer assessment would be residential areas with light surrounds. Where the pre-curfew illumination in the vertical plane is 10 lx and respectively the illumination in the curfewed hour's vertical plane is 2 lx.

**RECOMMENDED MAXIMUM VALUES OF LIGHT TECHNICAL PARAMETERS
FOR THE CONTROL OF OBTRUSIVE LIGHT**
(See Clause 2.7)

1	2	3	4	5
Light technical parameter	Application or calculation conditions (see also Figure 2.1 and Section 5)	Recommended maximum values		
		In commercial areas or at boundary of commercial and residential areas*	Residential areas	
			Light surrounds†	Dark surrounds‡
Illuminance in vertical plane (E_v)	<i>Pre-curfew:</i> Limits apply at relevant boundaries of nearby residential properties, in a vertical plane parallel to the relevant boundary, to a height commensurate with the height of the potentially affected dwellings. Values given are for the direct component of illuminance	25 lx	10 lx	10 lx
	<i>Curfewed hours:</i> Limits apply in the plane of the windows of habitable rooms of dwellings on nearby residential properties. In the absence of development (i.e. vacant allotment), the limits apply on the potentially affected property, in a vertical plane parallel to the relevant boundary, at the minimum setback permitted for a dwelling, to a height commensurate with land use zoning provisions. Values given are for the direct component of illuminance	4 lx	2 lx	1 lx

AS/NZS 1158.3.1:2005 Part 3.1 Pedestrian Area Lighting

The AS/NZS 1158 standard applies to the lighting of roads and other public spaces. Part 3.1: Pedestrian area (Category P) lighting – Performance and design requirements outlines the required performance of pedestrian area lighting based on an assessment of degree of activity, risk of crime and the required aesthetic appeal (prestige). Particular reference is made in 1158.3.1:2005 that;

'In achieving the required performance, attention should be paid to minimizing adverse effects of the night time environment'.

The table below is an extract of 1158.3.1:2005 table 2.5, which stipulates that the parking spaces should be category P11a, P11b or P11c base on activity, occupancy and risk of crime.

**LIGHTING CATEGORIES FOR OUTDOOR
CAR PARKS
(INCLUDING ROOF-TOP CAR PARKS)**

1	2	3	4	5
	Selection criteria ^{a)}			
Type of area	Night time vehicle or pedestrian movements	Night time occupancy rates (NTOR)	Risk of crime ^{b)}	Applicable lighting subcategory ^{c)}
Parking spaces, aisles and circulation roadways	High	>75%	High	P11a
	Medium	≥25%, ≤75%	Medium	P11b
	Low	<25%	Low	P11c
Designated parking spaces specifically intended for people with disabilities	N/A	N/A	N/A	P12

Also discussed in the Part 3.1 of 1158 in the lighting categories used for road reserves in local areas. The table below is an extract of 1158.3.1:2005 table 2.1, which details the lighting subcategories that should be applied when lighting roads or pathways base on activity, crime and need to enhance prestige.

LIGHTING CATEGORIES FOR ROAD RESERVES IN LOCAL AREAS

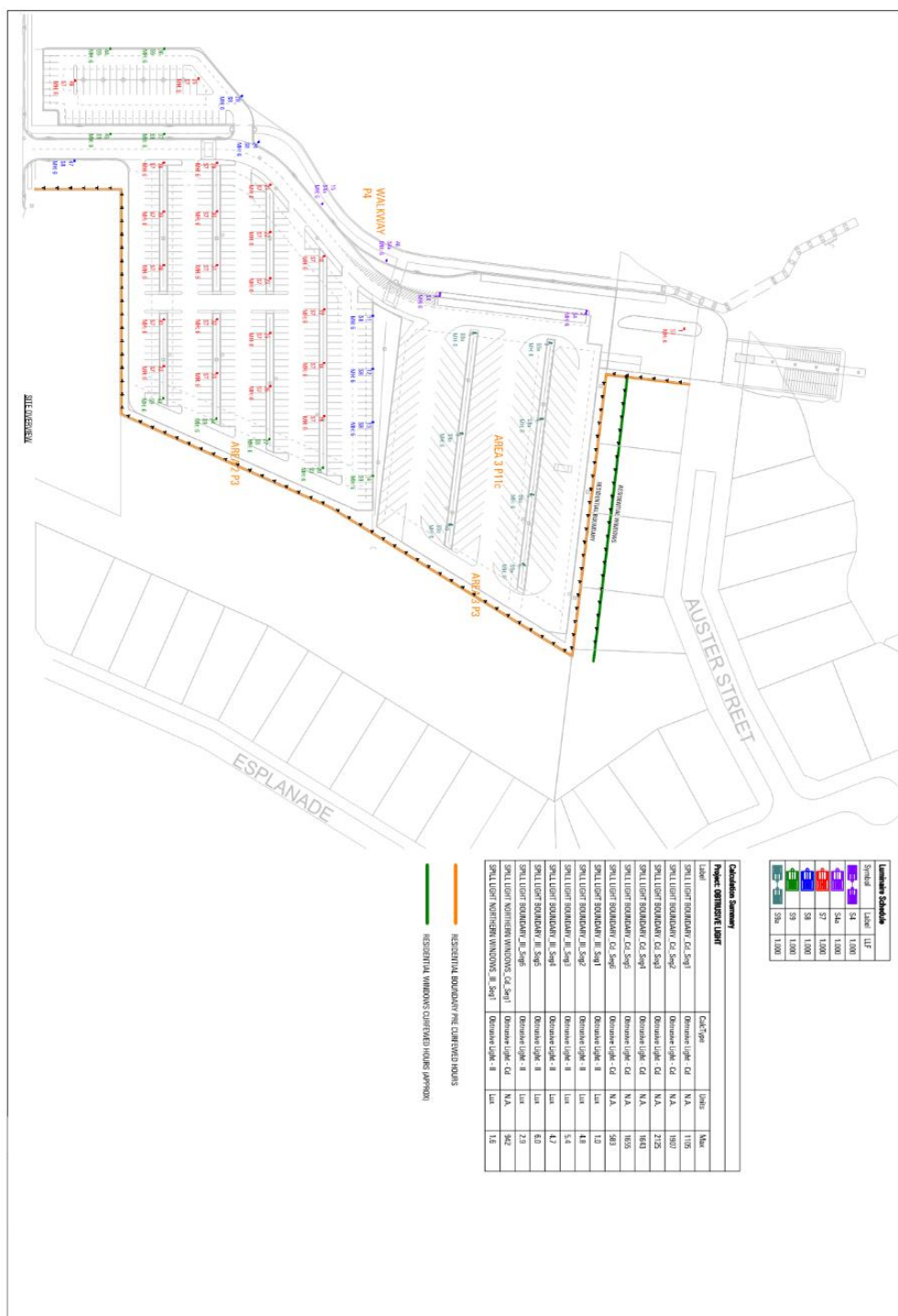
1	2	3	4	5	6
Type of road or pathway	Selection criteria ^{a,b)}				
General description	Basic operating characteristics	Pedestrian/cycle activity	Risk ^{f)} of crime	Need to enhance prestige	Applicable lighting subcategory ^{c,d)}
Collector roads or non-arterial roads which collect and distribute traffic in an area, as well as serving abutting properties	Mixed vehicle and pedestrian traffic	N/A	High	N/A	P1
		High	Medium	High	P2
		Medium	Low	Medium	P3
		Low	Low	N/A	P4
Local roads or streets used primarily for access to abutting properties, including residential properties	Mixed vehicle and pedestrian traffic	N/A	High	N/A	P1
		High	Medium	High	P2
		Medium	Medium	Medium	P3
		Low	Low	N/A	P4
Common area, forecourts of cluster housing	Mixed vehicle and pedestrian traffic	Low	Low	N/A	P5 ^{e)}
		N/A	High	N/A	P1
		High	Medium	High	P2
		Medium	Low	Medium	P3
		Low	Low	N/A	P4

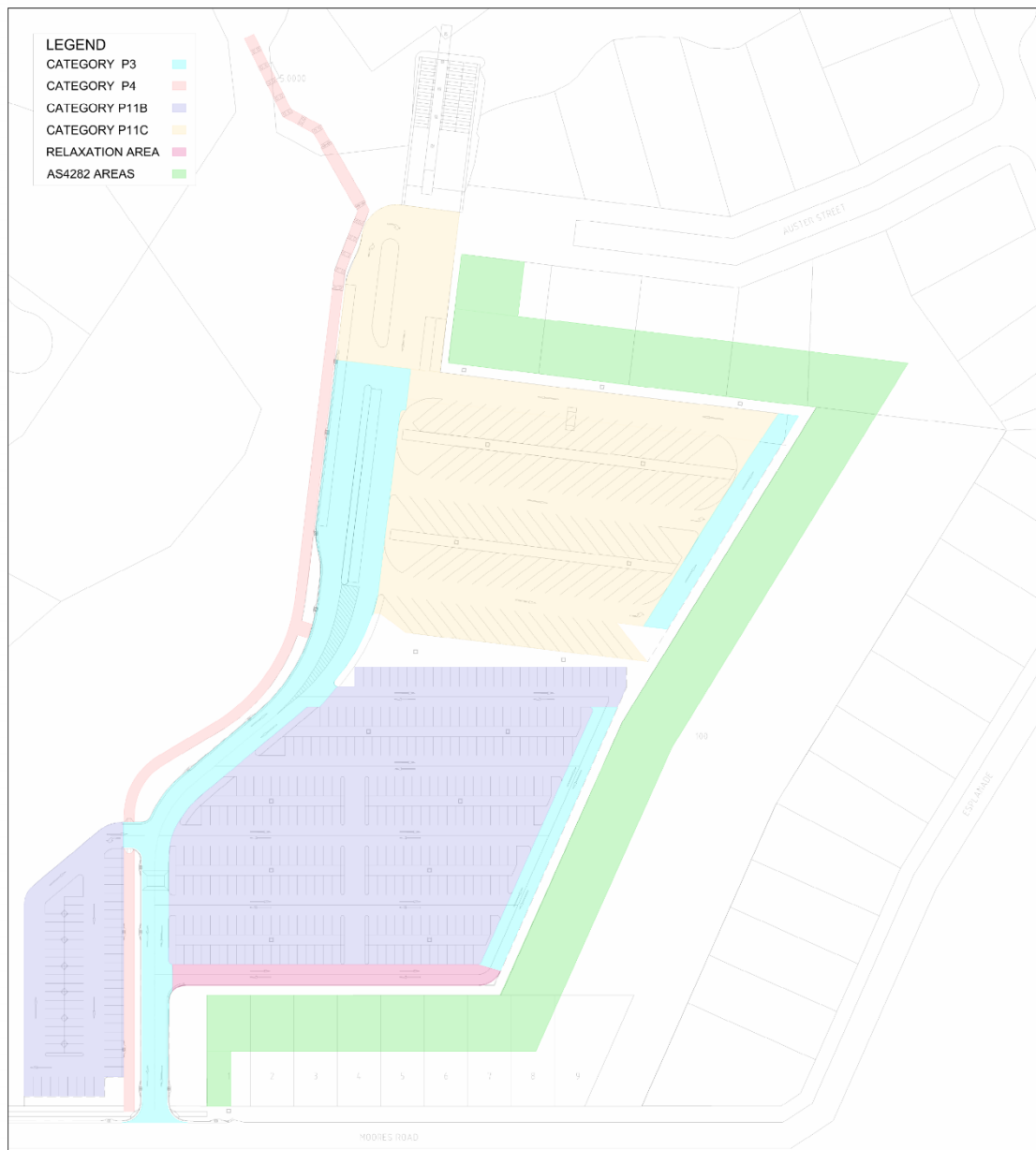
AS/NZS 1158 Lighting Assessment

By applying the criteria outlined previously in this report the image below details the areas that were investigated and the lighting criteria that was considered for overall final design described as Stage 3.



The image below details the same design and demonstrates AS4282 compliance.





The image above details the lighting categories compliances that were achieved while maintaining a compliant AS4282 obtrusive lighting design. The obtrusive light compliance requirements reports are in Appendix C. By observing the above image, it can be seen that the achievable design varies slightly from the desired design. However, the category of lighting is determined by the factors of use, crime and aesthetic appeal.

5. CONCLUSION.

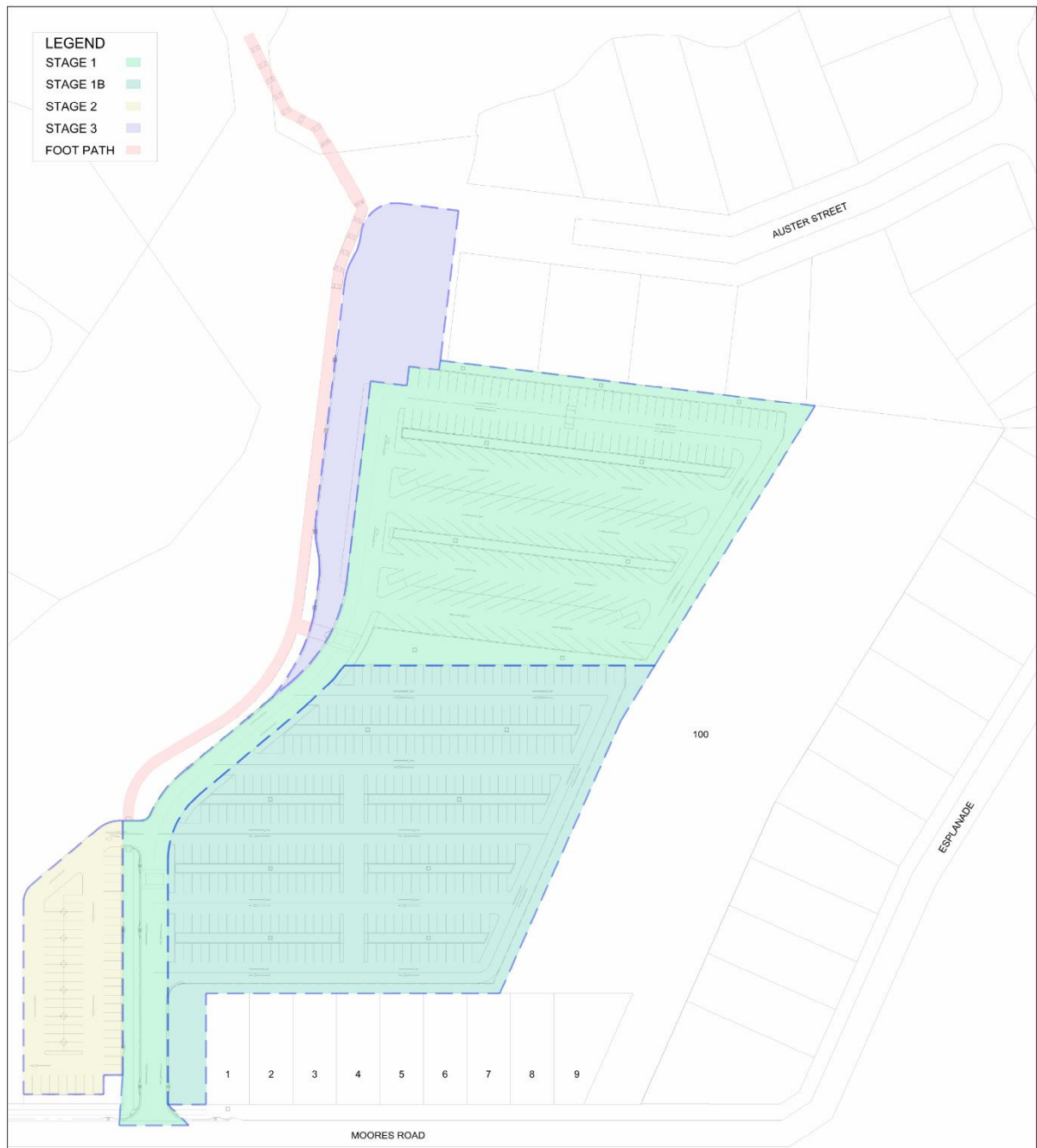
From the information discussed within this report it can be observed that a compliant AS4282 design can be achieved. However, to meet the AS4282 design requirements concessions need to be applied to the AS/NZS 1158 criteria that is applied to the design. This is evident in the southern area where the road the adjoins the residential lots. To meet the AS4282 requirements in curfew hours 2lx this section of carpark would need to be classified as P3.

The driving factors of the design focused on the existing residential dwellings and the primary use of the carpark. The major constraint on achieving a compliant design was AS4283 curfew limitations. As discuss it was initially perceived that category 11B could be achieved for the entire carpark. However, due to the line making changes between stage 1 and stage 3 there is a need to maintain flexibility in the boat trailer parking area thereby limiting the positioning of luminaries. This constraint is compounded by increased distance of 8m between the trailer parking aisles.

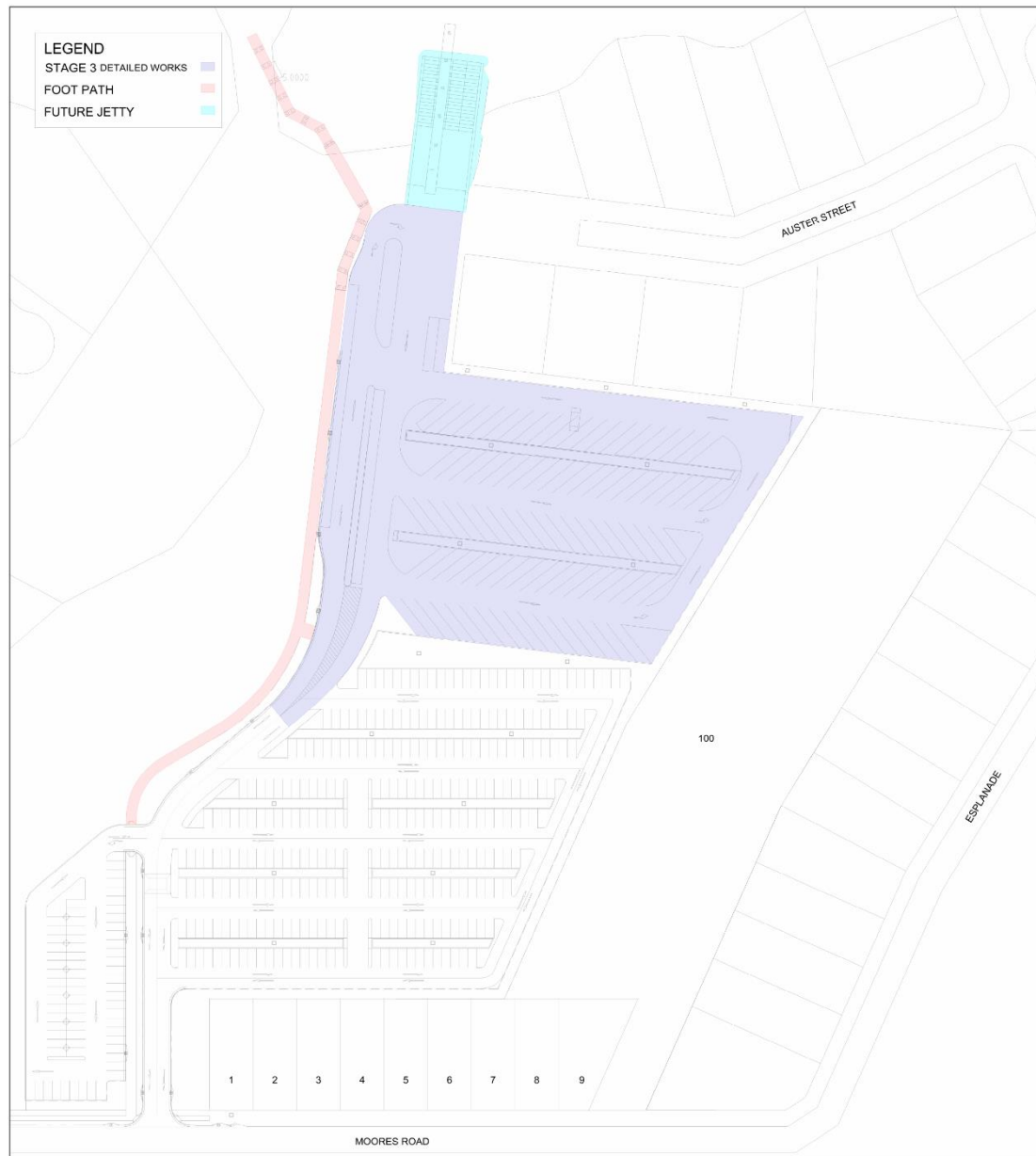
Under the assessment of 11c criterial where the night time vehicle or pedestrian movements are low, and the occupancy rates are <25%, where there is a low risk of crime, a compliant AS4283 design was achieved. There were no issued obtaining category P4 lighting levels to the pedestrian walkways.

6. APPENDIX A

Stage 1, 1A and 2 Layout



Stage 3 Layout, with modified parking layout.



7. APPENDIX B

1158.3.1:2005 Technical Lighting Parameters, Tables 2.6, 2.7, 2.8 and 2.9

TABLE 2.6

VALUES OF LIGHT TECHNICAL PARAMETERS AND PERMISSIBLE LUMINAIRE TYPES FOR ROADS IN LOCAL AREAS AND FOR PATHWAYS

1	2	3	4	5	6
Lighting subcategory	Light technical parameters				Permissible luminaire type (see Table 2.10)
	Average horizontal illuminance ^{a,b)} ($\bar{E}_h$)	Point horizontal illuminance ^{a,b)} (E_{ph})	Illuminance (horizontal) uniformity ^{c)} Cat. P (U_{E2})	Point vertical illuminance ^{a,b)} (E_{pv})	
	lux	lux		lux	
P1	7	2	10	2	Type 4 where part of a road reserve or Types 2, 3, 4 or 6 elsewhere
P2	3.5	0.7	10	0.7	
P3 ^{d)}	1.75	0.3	10	0.3 ^{d)}	
P4 ^{e)}	0.85	0.14	10	N/A	
P5 ^{e)}	0.5	0.07	10	N/A	

^{a)} These values are maintained.

^{b)} Compliance is achieved by being greater than or equal to the applicable table value.

^{c)} Compliance is achieved by being less than or equal to the applicable table value.

^{d)} The vertical illuminance requirement only applies when subcategory P3 is selected for application to pathways, i.e. it does not apply for local roads.

^{e)} The values for New Zealand for subcategories P3 and P3R are also subject to the lamp source lumen derating values as per Clause 2.6. The New Zealand values are as per the table below. In New Zealand, when the luminaires are to be supported on existing reticulation poles, the subcategories P3R and P4R may be designated and the following reduced levels applied:

Subcategory	$\bar{E}_h$	E_{ph}	E_{pv}
P3 (NZ)	1.3	0.22	0.22
P3R	0.9	0.11	N/A
P4R	0.7	0.07	N/A

Subcategory P5 lighting shall not be chosen for this situation.

NOTES:

- Validation of the values in Columns 2 to 5 is by calculation, not field measurement. This is particularly relevant to small values in Columns 2, 3 and 5, which will typically be difficult to validate by field measurements.
- See Section 3 for the design methods and requirements for use in assessing compliance with the specified light technical parameters.

TABLE 2.7
VALUES OF LIGHT TECHNICAL PARAMETERS AND PERMISSIBLE
LUMINAIRE TYPES FOR PUBLIC ACTIVITY AREAS
(EXCLUDING CAR PARKS)

1	2	3	4	5	6
Lighting subcategory	Light technical parameters				Permissible luminaire type (see Table 2.10)
	Average horizontal illuminance ^{a,b)} ($\bar{E}_h$)	Point horizontal illuminance ^{a,b)} (E_{ph})	Illuminance (horizontal) uniformity ^{c)} Cat. P (U_{E2})	Point vertical illuminance ^{a,b)} (E_{pv})	
	lux	lux		lux	
P6	21	7	10	7	Types 2, 3, 4, 5 or 6
P7	14	4	10	4	
P8	7	2	10	2	

^{a)} These values are maintained.

^{b)} Compliance is achieved by being greater than or equal to the applicable table value.

^{c)} Compliance is achieved by being less than or equal to the applicable value.

NOTE: See Section 3 for the design methods and requirements for use in assessing compliance with the specified light technical parameters.

TABLE 2.8
VALUES OF LIGHT TECHNICAL PARAMETERS AND PERMISSIBLE
LUMINAIRE TYPES FOR CONNECTING ELEMENTS

1	2	3	4	5	6
Lighting subcategory	Light technical parameters				Permissible luminaire type (see Table 2.10)
	Average horizontal illuminance ^{a,b,d)} ($\bar{E}_h$)	Point horizontal illuminance ^{a,b)} (E_{ph})	Illuminance (horizontal) uniformity ^{c)} Cat. P (U_{E2})	Point vertical illuminance ^{a,b)} (E_{pv})	
	lux	lux		lux	
P9	Same as for highest lighting subcategory applying to areas that abut the connecting element but, where forming part of a road or pathway, to be not less than subcategory P8 in Table 2.3.				Types 3, 4, 5 or 6
P10	35	17.5	10	17.5	

^{a)} These values are maintained.

^{b)} Compliance is achieved by being greater than or equal to the applicable table value.

^{c)} Compliance is achieved by being less than or equal to the applicable value.

^{d)} For steps, the requirements assume that the noses of the treads are clearly delineated by a contrasting stripe or other equally effective means. If this does not apply, the illuminance should be at least twice the value specified.

NOTES:

1 It is recommended that the walls of subways be finished in a light colour to facilitate interreflection of light within the space. Such interreflected light may be taken into account in the achievement of the specified light technical parameters.

2 See Section 3 for the design methods and requirements for use in assessing compliance with the specified light technical parameters.

TABLE 2.9
VALUES OF LIGHT TECHNICAL PARAMETERS AND PERMISSIBLE
LUMINAIRE TYPES FOR OUTDOOR CAR PARKS
(INCLUDING ROOF-TOP CAR PARKS)

1	2	3	4	5	6
Lighting subcategory	Light technical parameters ^{a)}				Permissible luminaire type (see Table 2.5)
	Average horizontal illuminance ^{a,b)} ($\bar{E}_h$) lux	Point horizontal illuminance ^{a,b)} (E_{ph}) lux	Illuminance (horizontal) uniformity ^{c)} Cat. P (U_{E2})	Point vertical illuminance ^{a,b)} (E_{pv}) lux	
P11a	14	3	10	3	Types 3, 4, 5 or 6
P11b	7	1.5	10	1.5	
P11c	3.5	0.7	10	—	
P12	—	≥ 14 and $\geq \bar{E}_h$ ^{d)}	—	—	

^{a)} These values are maintained.

^{b)} Compliance is achieved by being greater than or equal to the applicable table value.

^{c)} Compliance is achieved by being less than or equal to the applicable table value.

^{d)} E_{ph} shall be determined for each P12 area in the car park and, in each case, it shall be greater than the value stated and greater than the average for the overall car park.

NOTES:

- See Section 3 for the design methods and requirements for use in assessing compliance with the specified light technical parameters.
Compliance with the light technical parameters in Table 2.9 is based on an open, unoccupied car park, i.e. free of vehicles. However, it is important that the design of the lighting system (e.g. numbers, locations, heights and outputs of the luminaires) be such that adequate light is provided between parked vehicles.
- Where raised obstructions are present, e.g. to limit vehicle movement in parking areas, these obstructions present potential hazards for pedestrians. Such obstructions should therefore be of such a material, or so finished, as to provide a high visual contrast with the paved surface.
- See Table 2.8 for the requirements that apply to connecting elements, including steps, ramps and pedestrian crossing points, within car parks.
- The luminaires should be positioned to highlight physical obstructions or other similar hazards to pedestrian and vehicular traffic.
- Lighting requirements for indoor car parks are set out in AS 1680.2.1.

8. APPENDIX C

Obtrusive Light – Compliance Reports

Obtrusive Light - Compliance Report

AS 4282-1997, Pre-Curfew, Residential - Light Surrounds
Filename: 6985 Rev 4
15/11/2018 2:11:41 PM

Illuminance

Maximum Allowable Value: 10 Lux

Calculations Tested (6):

Calculation Label	Test Results	Max. Illum.
SPILL LIGHT BOUNDARY_III_Seg1	PASS	1.0
SPILL LIGHT BOUNDARY_III_Seg2	PASS	4.4
SPILL LIGHT BOUNDARY_III_Seg3	PASS	5.4
SPILL LIGHT BOUNDARY_III_Seg4	PASS	4.7
SPILL LIGHT BOUNDARY_III_Seg5	PASS	6.0
SPILL LIGHT BOUNDARY_III_Seg6	PASS	2.9

Luminous Intensity (Cd) Per Luminaire

Maximum Allowable Value: 7500 Cd
Control Angle: 83 Degrees

Luminaire Locations Tested (56)

Test Results: **PASS**

Obtrusive Light - Compliance Report

AS 4282-1997, Post-Curfew, Residential - Light Surrounds
Filename: 6985 Rev 4
15/11/2018 2:13:53 PM

Illuminance

Maximum Allowable Value: 2 Lux

Calculations Tested (1):

Calculation Label	Test Results	Max. Illum.
SPILL LIGHT NORTHERN WINDOWS_III_Seg1	PASS	1.6

Luminous Intensity (Cd) At Vertical Planes

Maximum Allowable Value: 1000 Cd

Calculations Tested (1):

Calculation Label	Test Results
SPILL LIGHT NORTHERN WINDOWS_Cd_Seg1	PASS